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STUDIES IN THE CLASSIFICATION AND NOMENCLATURE OF THE BACTERIA

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CHLAMYDOBACTERIALES

BY

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Sheath

STUDIES IN THE CLASSIFICATION AND NOMENCLATURE OF THE BACTERIA

VII. THE SUBGROUPS AND GENERA OF THE CHLAMYDOBACTERIALES

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intermediary
Chlamydiales
algae

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Order II. **Chlamydobacteriales.** *ordo nov.*

Synonyms:

- Cladotrichiae* Trevisan, 1879, p. 15
- Cladotricheen* Zopf, 1883, p. 45
- Cladothrichacei* Schroeter, 1886, p. 173
- Cladothricheae* Hueppe, 1886, p. 140
- Leptotrichacei* Schroeter, 1886, p. 170
- Crenotricheae* DeToni and Trevisan, 1889, p. 925
- Chlamydobacteriaceae* Migula, 1894, p. 237
- Desmobacteriaceae* Benecke, 1912, p. 188 in part
- Phycobacteriales* Engler

Filamentous bacteria, alga-like, typically water forms, frequently sheathed, without true branching although false branching may be present. The sheath is frequently impregnated with iron. Conidia may be developed, but never endospores. Sulphur granules or bacteriopurpurin never present. Mature cells or filaments not motile, not protozoan-like.

The order contains a single family *Chlamydobacteriaceae*.

Family I. **Chlamydobacteriaceae** Migula, 1894, p. 237

The following genera have been included in the family by various authors:

- Gaillonella* Bory, 1823
Sphaerotilus Kuetzing, 1833, p. 385
Gallionella Ehrenberg, 1838, p. 166
Leptothrix Kuetzing, 1843, p. 198
Didymohelix Griffith, 1853, p. 438
Crenothrix Cohn, 1872, p. 130
Siphonomyxa Billroth, 1874, p. 27
Cladothrix Cohn, 1875, p. 185
Leptotrichia Trevisan, 1879, p. 138, in part
Phragmidiothrix, Engler 1882, p. 19
Kurthia Trevisan, 1885, p. 92
Billetia Trevisan, 1889, p. 11
Detoniella De Toni and Trevisan, 1889, p. 929
Leptotrichella De Toni and Trevisan, 1889, p. 935
Streblotrichia Guignard, 1890, p. 124.
Eucrenothrix Hansgirg, 1891, p. 313
Chlamydothrix Migula, 1900, p. 1030
Clonothrix Schorler, 1904, p. 691.
Spirophyllum Ellis, 1907, p. 516
Nodofolium Ellis, 1910, p. 321.
Leucothrix Oersted, —, p. 44.

Of these the following will be disregarded because of the inadequate characterization of genus and species: *Billetia*, *Kurthia*, *Siphonomyxa*, *Streblotrichia*.

The following are algal genera to which certain of these organisms were incorrectly assigned: *Gaillonella*, *Gallionella*.

The following names are invalid because of the prior use of the names for distinct groups.

- Spirophyllum* Ellis, 1907, p. 516
 not *Spirophyllum* Schindler, 1905, p. 82
Cladothrix Cohn, 1875, p. 185
 not *Cladothrix* Nuttall, 1849

The following are subgenera: *Eucrenothrix*, *Leptotrichiella*, *Leucothrix*.

organisms supplying iron rust in water

The following generic names must be considered: *Chlamydothrix*, *Clonothrix*, *Crenothrix*, *Detoniella*, *Didymohelix*, *Leptothrix*, *Leptotrichia*, *Nodofolium*, *Phragmidiothrix*, *Sphaerotilus*.

The following key give the characters which are believed by the writer to differentiate the genera which may be recognized.

Key to the genera of Chlamydobacteriaceae

1. Filaments not usually permanently attached.
 - a. Filaments straight, or at least not twisted.....Genus 1. *Leptothrix*
 - b. Filaments twisted.....Genus 2. *Didymohelix*
2. Filaments attached.
 - a. Filaments unbranched.....Genus 3. *Crenothrix*
 - b. Filaments show pseudodichotomous or false branching.
 - (1) Swarm cells developed (motile conidia). Usually without a deposit of iron oxid in the sheath.....Genus 4. *Sphaerotilus*
 - (2) Spherical, non-motile conidia. Usually with iron oxide.
Genus 5. *Clonothrix*

like hair
twisted

Genus 1. **Leptothrix** Kuetzing, 1843, p. 198

Synonyms:

Chlamydothrix Migula, 1900, p. 1030

Leptotrichia Trevisan, 1879, p. 138

Detoniella Trevisan, 1889, p. 929

Filaments of cylindric colorless cells, with a sheath at first thin and colorless, later thicker, yellow or brown, becoming encrusted with iron oxide. The iron may be dissolved by dilute acid, whereupon the inner cells show up well. Multiplication is through the division and abstriction of cells and motile cylindric swarm cells. Swarm cells sometimes germinate in the sheath giving appearance of branching. Pseudodichotomous branching may occur.

The type species is *Leptothrix ochracea* (Leiblein) Kuetzing.

There has been considerable confusion relative to the appropriate designation of this genus. The name *Leptothrix* was created by Kuetzing for certain forms regarded as algae. The first species named was *L. ochracea*, the *Lyngbya ochracea* of Leiblein. Three other species were also described. *Leptothrix buccalis* an organism from the mouth, was named by Robin in 1852.

These facts have led to the development of three conceptions of the genus as follows:

1. *Leptothrix*. A genus of bacteria with the *L. ochracea* as the type.

2. *Leptothrix*. A genus of bacteria with *L. buccalis* as the type.

3. *Leptothrix*. A genus of algae. In this sense the genus has been recognized by many algologists. However, it may be noted that by recent writers (as in West's British Fresh Water Algae) the genus *Leptothrix* is made a synonym of *Lyngbya*. Many authors include *L. ochracea* with the algae.

Inasmuch as *Leptothrix ochracea* was definitely first named in this genus, it would seem to be entirely appropriate to make it the type of the genus.

It should be noted that this renders *Leptothrix* as applied to organisms such as *L. buccalis* quite invalid.

Genus 2. **Didymohelix** Griffith, 1853, p. 438

Synonyms:

Gaillonella Bory, 1823, in part

Gallionella Ehrenberg, 1838, p. 166, in part

Gloeotila Kuetzing, 1843, p. 245, in part

Spirophyllum ? Ellis, 1907, p. 516

Nodofolium ? Ellis, 1910, p. 321

Filament twisted, simple, or two filaments, twisted together. Young cells colorless, later yellow brown to rust red through deposition of iron. Simple filaments show no division into cells, even when iron is removed with acid and stain applied. Sheath not demonstrable.

The type species is *Didymohelix ferruginea* (Ehr.) Griffiths.

The generic name *Gaillonella* was first used by Ehrenberg as a revised spelling of *Gaillonella*, a genus of diatoms created by Bory de St. Vincent. Ehrenberg included several true diatoms in the genus, together with this form, which he erroneously believed contained silicon, and to be a diatom. *Gaillonella* is a valid diatom genus (or subgenus of *Meloseira* according to some authors), and should not be used as a generic name for bacteria.

Genus 3. Crenothrix Cohn, 1870, p. 130

Filaments unbranched, showing differentiation of base and tip, attached, usually thicker toward the tip. Sheaths plainly visible usually colorless, brownish from iron oxid in old filaments. Cells cylindric to spherical. Multiplication by non-motile, spherical, conidia; cells dividing in 3 planes to form conidia.

The type (and only) species is *Crenothrix polyspora* Cohn.

Genus 4. Sphaerotilus Kuetzing, 1833, p. 385**Synonyms:**

Cladothrix Cohn, 1875, p. 185

Attached colorless threads showing false branching, making a psuedodichotomy. Filaments consist of rod or oval cells, surrounded by a thin, firm sheath. Multiplication occurs both by non-motile and motile gonidia, the latter with a clump of flagella near one end.

Sphaerotilus natans Kuetzing is the type.

Genus 5. Clonothrix Schorler, 1904, p. 689

Filaments with false dichotomous or irregular branching, attached, with contrast of base and tip, tapering to the tip. Sheath always present, thin on young filaments, later becoming thicker and encrusted with iron or manganese. Multiplication by small non-motile gonidia of spherical form, formed from the disk shaped cells near tip by longitudinal division on rounding up.

The type species is *Clonothrix fusca* Schorler.

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